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Outside-the-Brain Changes in Beginning Readers

Mature readers may use the spelling system differently than beginning readers do by activating a specialized area of the brain for recognizing words and spelling patterns automatically. The automatic circuitry isn't activated for beginning readers. As we have seen from brain scan research, this is one of the important differences in beginning and skilled reading. Looking from outside the brain, we also see differences in the beginning and skilled processes. We see beginning readers and writers morphing. Phase theorists for word learning and developmental spelling researchers have discovered the existence of four phases of early reading and writing development as children try to discover a pattern system for spelling that eventually leads to automatic word recognition. It is important for teachers of beginning reading to recognize these four phases, to understand how readers and writers approach decoding and encoding differently in each phase, and to plan instruction that moves children from lower earlier phases to higher later phases and eventually to skilled automatic processing. First we will observe concomitant changes in early reading and writing and take full advantage of writing and reading reciprocity. Then we will see how teachers in kindergarten and first grade and teachers who work with struggling readers help bridge the gap between nonreading and skilled reading by gearing instruction to the particular phase of development.

The four phases don't account for everything beginning readers and writers must learn in the beginning, but keep in mind that a lot of what we already do works very well in the teaching of reading. Teachers with Reading Recovery training, for example, are quite masterful at teaching reading by using tools for helping individuals who struggle with reading. And we have made remarkable improvement in our use of leveled text and guided reading in classroom instruction (Fountas and Pinnell 1996; 2001) and incorporating methods for

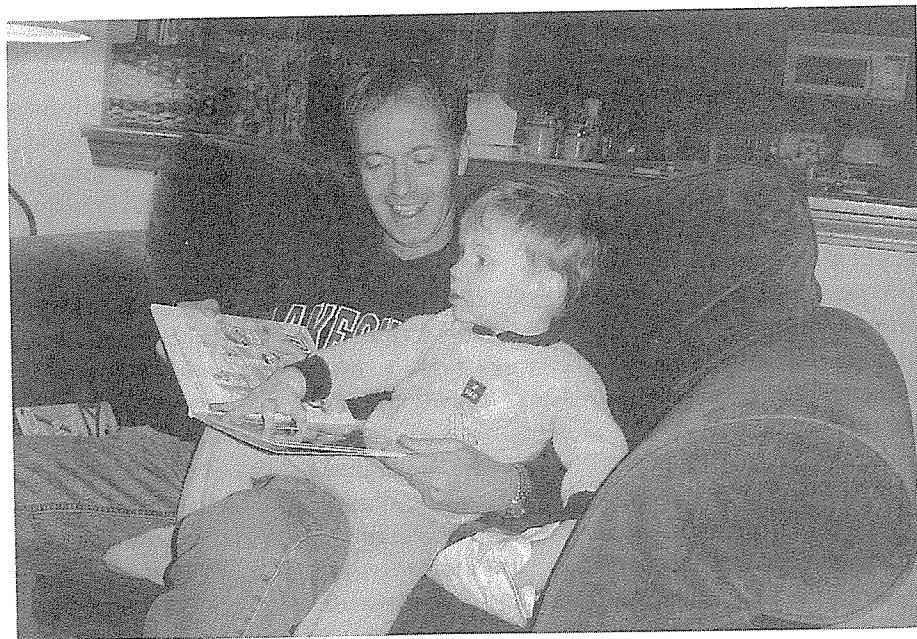
increasing fluency (Allington 2001). The four phases will help us add a new, necessary component, however, which focuses on some of the more basic levels of processing. I believe these basic aspects of reading are the areas least understood by teachers and the areas of instruction where teachers might use new tools to increase the success rate with teaching beginning reading. These include work leading to the core mechanism of chunking spelling patterns.

The phases are really, in my view, spelling phases that the child applies to both reading and writing. These phases relate most specifically to the work of the orthographic processor in the Seidenberg and McClelland model (see Chapter 1). Spellings in English are patterns that must be detected by the brain for reading, but they are not one-letter-to-one-sound patterns; they are multiletter patterns or letter groups, and often, complex chunks of vowel and consonant combinations. *A lot of knowledge about spelling is necessary before a child can use the whole complex system the way mature readers use it.* During beginning reading phases, the child is attempting to discover the pattern or chunking system. There is no inborn and automatic recognition of the pattern system for spelling as is the case with the sound patterns or the contextual and meaning patterns of spoken language. Speaking comes naturally because the brain is innately wired to recognize and produce its complex patterns. A baby born in Italy almost immediately responds to patterns in the rhythm, pitch, and cadence in the mother's voice and after several months will recognize and babble the twenty-five sounds of the Italian language—the child now recognizes the sound pattern system for Italian. Likewise, after several months, a baby born into an English-speaking family begins firing neurons in his or her brain eliciting the forty-four sounds of English. The human brain's ability to find regular patterns in the native language is largely prewired. No one has to teach these sounds because the human brain recognizes the patterns of phonemes that make up the speech sounds of a particular language automatically. The same is *not* true of spelling patterns. We have to teach the child how to find the regular patterns within print. That's not to say, however, that the first thing to happen is necessarily the teaching of spelling in kindergarten.

Teaching reading can begin *very* early. I think it's important to pause at this juncture, and emphasize the possibilities for early beginnings. I believe teaching reading begins by teaching children to love books—even before they can speak. I watched my one-year-old godson on his first birthday, who was just speaking his first words, handle soft fabric books and board books. Books were already some of his favorite "toys." He attached meaning to the word *book* and responded to "Get the book, Aidan," by crawling to the box where the books were kept and pulling them out. At about the same time he learned to crawl up and down the stairs, and respond to commands such as "walk to Daddy" on the walker, and "sit next to Mattie" (the golden retriever), he already loved book experiences. At one year of age he was beginning to develop book-handling concepts; when his mother read to him he delighted in turning the pages and seemed to get the cue from the rhythm and cadence in her voice. I watched him

sit with a book and turn the pages on his own. His early "spelling skills" included pulling ABC letter magnets off the refrigerator, throwing them on the floor, and squealing. He had so many toys that provided recordings of the ABC song that his dad swore he woke up one morning and heard Aidan humming the alphabet song—"da, da, da, da, da, da, da . . ." I mention this to underscore powerful possibilities for the true beginnings of reading. At one year of age, even as he spoke his first words, this child's mind was already curious and fascinated by the magic of reading and interested enough to join in with his parents, curious enough to begin unlocking its mysteries. Beginning reading can (and should) begin long before our more formal work in kindergarten. Early book experiences are absolutely fundamental for setting the best stage for reading.

The way the pattern system of spelling is discovered is equally marvelous. It's logical, and straightforward as it unfolds in phases. The first phase begins with no recognition of the pattern. In the next phase the child discovers that the pattern has something to do with matching letters to sounds, but he or she can only make a few matches. In the third phase the child gets the gist of the pattern system, can match many letters with sounds, and, quite logically, attempts to use a straightforward one-letter-for-one-sound system. Finally the child enters a phase heralded by the discovery that English spelling isn't necessarily one-to-one but often it's chunk-to-chunk, and with this new understanding there is enough regularity and pattern in the system that with a little practice finding the



An Early Beginning—Aidan Sharp and the Author

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regular patterns, backed up by higher-level processes such as context and meaning, the brain can soon recognize the spelling patterns automatically.

Once the brain can recognize patterns like the ones in *in-ter-est-ing* and *Al-a-bam-a*, the assemblages of neurons fire in sync as the reader analyzes these particular pattern sequences correctly a number of times, eventually forming an exact neural model for the word, thereby recognizing the word automatically. Certain teaching strategies or "experiences" facilitate the move to pattern recognition starting with no recognition, to partial recognition such as recognition of the beginning letter and sound, to full recognition of a letter for every sound, and finally to consolidating groups of letters into chunks. These teaching strategies leading the child to certain "experiences" are important because patterns in the brain are shaped by experience as well as by genes.

The beginning phases anchored in the discovery of the spelling system are, admittedly, phases at the lowest level of processing, but that makes them even more important because they lay the foundation for skilled reading. Without recognition of the patterns, skilled and automatic reading cannot happen. The phases represent points on a continuum in the development of the alphabetic principle, and for many children, they are a two-year journey in breaking the complex code of the chunking system of English spelling. I believe much more can be done to match the type and timing of instruction with the particular phase in which children are functioning. Showing teachers how to do that is the major thrust in the chapters ahead. In my view, with appropriate instruction, we might reasonably expect most children to move through the beginning phases and acquire the basic mature, grown-up literacy skills by the time they are seven or eight years old. Shaywitz believes that this kind of work, what she would refer to as appropriate decoding instruction, may even go a long way in the elimination of dyslexia if intervention comes early in the child's development when the brain is still adaptable. The phases provide guideposts for early intervention.

Too often we have looked at aspects of beginning reading—learning letters, matching individual letters to sounds, phonemic awareness, learning phonics—as separate activities when, in fact, they are points on a continuum of the lengthy process of unlocking the alphabetic principle. In English this is not one-to-one but a chunking of letter groups to sounds. There's a great deal of research supporting the notion that phonemic awareness is a critical factor in learning to read (Adams 1990; Blachman 2000; Liberman, Shankweiler, Fischer, and Carter 1974; Mattingly 1972; Morris et al. 2003; National Institute of Child Health and Human Development 2000; Snow et al. 2000), but that's just the first part of the story. Ultimately the beginning reader/writer must learn the whole complex process—not just the phonemic awareness part, but ultimately, he must go through all four phases that lead to automatic chunking of spelling patterns. Only then are the lower-level processes that focus attention on spelling for decoding or encoding released to the automatic recesses of the mind (literally,



Area C in Figure 2.1, page 15) allowing the brain much more freedom to concentrate full attention to the higher levels of cognition such as comprehension, problem solving, reasoning, and critical thinking.

It's important to point out that the conception of phonemic awareness is important for reading only because it relates to the child's eventual need to pay attention to how spelling works. Other phonological awareness concepts such as recognition of rhyming words, syllables as units of sounds in a word that may be clapped out, recognition of onsets and rimes, word families, and the whole realm of knowledge surrounding recognition of phonics patterns, are all spelling concepts. There are certain times in early reading and writing development that particular instructional techniques mesh well with how the child thinks spelling works and what the child is doing with spelling at a particular point in early development when she reads or writes. In the beginning reading and writing classroom, however, too often we divide the child's world into a reading period and a writing period, and now the "phonemic awareness" period but if you ask the teacher about spelling she says, "Oh, we don't teach spelling in kindergarten." Good spelling instruction in kindergarten, among other things, moves children forward by degrees in their level of phonemic awareness as that level of awareness changes with each phase. Yet, too often, only one lockstep sequence of instruction is offered for all children regardless of a particular individual's level or phase of development, with too few teachers implementing multilevel instruction in the mixed ability classroom. Thus something called "phonemic awareness" becomes an isolated objective as opposed to a part of a developmental continuum.

Phase theorist Linnea Ehri points out the arbitrary division of reading and spelling in work that has received far too little attention from educators and teachers in the classroom, "Learning to Read and Learning to Spell Are One and the Same, Almost."

The English language includes two terms, *reading* and *spelling*, that are used by researchers and teachers to divide the world. Researchers classify studies into those focused on reading, those focused on spelling, and those focused on relations between reading and spelling. Teachers plan lessons to teach reading during one period and different lessons to teach spelling during another period of the school day. All this presumes that there are two separate things that are being studied or taught. (1997, 238)

The problem Ehri identifies may not be so much that the teachers are focusing on different lessons at different times, but that the content of spelling instruction is often far off-base from what is needed at a particular phase of the developing reader or writer. Contemporary models of reading and brain scan studies both point in the direction that reading, writing, and spelling are connected processes in the brain. We need to bring the reality of what we do in the

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beginning reading classroom, or in our work with struggling readers, closer to the child's own reality—closer to what is happening in the child's mind as he or she develops reading, writing, and spelling skills reciprocally.

There are certain teaching strategies focused on helping the reader or writer understand how spelling works that are particularly well suited for particular phases of development. When is it best to point out rhymes, clap out syllables, do hand spelling with onsets and rimes, use finger spelling, or sort particular spelling patterns, for example? What are the particular spelling patterns that are important for certain phases of development? Many teachers miss these timely teachable opportunities and fail to make a connection with what is going on in the child's mind as he or she processes the spelling component when reading or writing. While I agree with Ehri's earlier point about the problems caused by the arbitrary division of spelling and reading, there is a caveat. It is not so much that spelling and reading are taught at different times, but that we do such a poor job of teaching spelling. Spelling is given low status by teachers because much of what we do with it seems to be busywork and a waste of time. For example, we don't need more one-size-fits-all spelling worksheets that are so commonplace in the spelling components of many current reading programs (Gentry 2004). Rather, we need teachers who understand the spelling component of the reading process and who know how to *connect* the appropriate teaching of spelling in a particular phase with the teaching of reading and writing. Another problem is that *connecting* the teaching of spelling with reading and writing is often confused with *integrating* the teaching of spelling with reading and writing. An "integration" practice of pulling spelling words out of the reading material, for example, doesn't work, particularly if the words chosen for spelling are the wrong words. Most appropriate second-grade spelling words are words children learn to read in first grade—words such as *they*, *nail*, *funny*, and *hook*. Yet in many instances where reading and spelling are supposedly "integrated," the second-grade child who can't spell *they*, *nail*, *funny*, and *hook* is given reading vocabulary such as *America* and *country* to memorize. These are the wrong words. In my view, some of the worst examples of inappropriate spelling instruction have come out of attempts to integrate spelling with the teaching of reading and writing because children were treated as if they were prewired to pick up perfect spelling and appropriate spelling instruction receives short shrift (Gentry 2004). Ehri's comment about reading teachers dividing the world between reading and spelling is not supportive of the current surge of spelling components in reading programs, which, rather than pay attention to appropriate spelling instruction based on phase theory and research, provide packets of inappropriate busywork, teach the wrong words and patterns at the wrong time, and waste the child's time with inappropriate activities often as absurd as sorting *swimming* and *chocolate* according to whether they have eight letters or nine letters. These materials provide little of what I would consider to be research-based instruction (see Gentry 2004).

The Development of Phase Theory for Sight-Word Learning

Linnea Ehri, a professor of educational psychology at the Graduate Center of the City University of New York, is the researcher primarily responsible for developing phase theory of sight-word learning, a theory that explains how the beginner reads words from memory. Ehri has provided a comprehensive description of the full range of word knowledge development for reading, which progresses in four phases between nonreading and skilled reading. There is considerable variation among individual children but it's not unusual for these four phases to take children as long as two years to accomplish: Ehri's pre-alphabetic, partial alphabetic, full alphabetic, and consolidated alphabetic phases greatly affect the way children read (and spell) words (1992, 1997, 1998).

Phase 1, Pre-alphabetic Reading. The first phase is called *pre-alphabetic*. In this early phase of reading, the teacher in the classroom or a parent often observes the child "reading" words using no systematic letter-sound processing whatsoever. In other words, these readers do not understand how the real system works. Pre-alphabetic readers match logos or visual memories of certain combinations of the squiggly symbols we call letters to particular spoken words. Often pre-alphabetic reading first occurs when the child notices print in his or her environment. The child may be observed to "read" the word on the stop sign or the name on a cereal box, but in reality, while the visual form of the word's spelling is cueing the reading, the child is not paying attention to letter-sound correspondences. He is paying attention to nonalphabetic information. The visual cue might be the design of the logo—an association between the M and the golden arches cueing the correct reading of the word "McDonald's," for example. Studies such as one by Harste, Burke, and Woodward (1982) showed that pre-alphabetic readers often made interesting miscues that show that they weren't attending to spellings. *Crest* was read as "toothpaste," or "brush teeth." Ehri called this phase pre-alphabetic because this type of reading occurred *before* a child understood the concept that letters represent sounds in spoken words.

Phase 2, Partial Alphabetic Reading. Ehri's work showed that beginning readers make a giant cognitive leap by moving from Phase 1 to Phase 2, from a pre-alphabetic to a *partial alphabetic* phase, a move signaling the dawn of the letter-sound concept. For the first time, Phase 2 readers can read words by matching a few letters—usually those at the beginning and ending of the word—with sounds. In order to do this the child must have some phonemic awareness and must know some letter-sound correspondences, thus making it possible to use one or two letters—often the first and last letter in a word—to cue a word when reading. Even though he or she is working with very limited letter-sound information, *for the first time the child is cueing on spelling*. No longer dependent on

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arbitrary visual cues like golden arches, the child is beginning to conceptualize a system for matching letters to sounds for cueing words by segmenting the spoken word into some of its sounds and matching it with a letter, beginning to see a pattern.

Readers at this stage generally don't pay attention to letters in the middle of a word, which are usually vowel letter-sound correspondences and often more complex than beginning and ending letter-sound matches. Medial letters (i.e., the letters in the middle of a word) may consist of patterns of chunks of letters and the child doesn't recognize these as patterns or know how the vowel spelling chunks work. What she can do is read a few words like *hop* by noticing the *h* and the *p*, but the Phase 2 system doesn't work very well if she must discriminate between *hop*, *hip*, *hit*, or *hot*. In studies where the Phase 2 reader is asked to read a nonword such as *kug*, it is very common for her to notice the *k* and *g* and give a real word such as *king* (Ehri 1997, 254). As Ehri says, Phase 2 readers "operate with rudimentary knowledge of some letter-sound relations" (204).

Another important finding is that readers at Phase 2, the partial alphabetic phase, probably don't have enough memory for detail in words to be able to read words by analogy unless they have the analogue or "word family" in view. If they know *cave* and see the new word *save*, they likely call it "cave" rather than make an analogy; they misread the new word because they are cueing from a partial spelling—in this case the *a*, the *v*, and the *e* which they remember for *cave* (Ehri and Robbins [1992] reported in Ehri [1997, 254]).

Darrell Morris suggests that it is very important for children to develop the ability to do the voice-to-print match at Phase 2, that is, to read a verse or short easy text from memory and point to the printed word at the same time she says it when reading out loud. This enables the child to grasp the concept of what a printed word is and, in effect, frame the word for analysis. So once the Phase 2 reader stabilizes the concept that a printed word matches a spoken word, he or she begins to realize words have middle parts, and that the middle part might give some cues too (Morris et al. 2003). Research has shown that the middle part is the hardest to read (Ehri 1998; Lewkowicz 1980; Morris et al. 2003).

Phase 3, Full Alphabetic. The next giant cognitive leap occurs when children start paying attention to all of the letters in the word; they have more letter-sound knowledge and start using more complete letter-sound correspondences when reading words. Ehri calls Phase 3 the *full alphabetic* phase, indicating that readers are paying attention to the full spelling, not just a few prominent letters at the beginning and end. Full alphabetic reading is heralded by the advent of full phonemic awareness when children have stabilized the concept of word, know that a word is made up of constituent sounds, and are able to provide all the phonemes in most words and manipulate them. It's also signaled when the reader begins to read more accurately than at the previous phase, since she is attending to each letter when reading a word.

Whereas [partial alphabetic] readers' limited memory for letters may cause them to misread *soon* or *spin* as *spoon*, full alphabetic readers' representations eliminate confusion because their representations are sufficiently complete to distinguish easily among similarly spelled words. (Ehri 1998, 21)

It appears to be easier to learn similarly spelled words at this stage. Ehri and Wilce (1987) found that Phase 3, full alphabetic readers learned a list of words such as *drip* and *dump*, or *bend* and *blond*, in only three trials. Phase 2, partial alphabetic readers could not learn as many similarly spelled words and when they did learn them it took them seven trials. Another great advantage at Phase 3 is that full alphabetic readers are able to read new words by analogy to known words, that is, to use known words to figure out unknown words. Unlike the Phase 2, partial alphabetic reader, if the Phase 3 reader knows *cave* and he sees the new word *save*, he is much more likely to read it correctly by analogizing. Still another advantage of Phase 3 reading is that Phase 3 readers tend to be successful at finger-point reading short memorized texts (Morris et al. 2003). But Phase 3 has limitations. English spelling is not a system of matching a letter to a sound; rather, it's a system of matching chunks of letters to sounds. In order to read a lot of words automatically, the beginning reader must make the chunking breakthrough.

Phase 4, Consolidated Alphabetic Reading. There is a difference in decoding and encoding that happens as the child moves from Phase 3 to Phase 4. In Phase 3, connections are formed in memory between individual graphemes and phonemes, but at Phase 4 the graphemes are *consolidated into chunks* of spelling patterns. Thus moving from Phase 3 to Phase 4 is a move from processing the word *interesting* virtually as individual letters (*i-n-t-e-r-e-s-t-i-n-g*), to processing it in chunks (*in-ter-est-ing*).

The brain has ~~finally found the patterns!~~ That's what makes it much easier to read new words and store known words in memory at Phase 4. With some experience reinforcing the recognition of the patterns, the brain activates an area that can read many words automatically from memory and analogize hundreds of words (and syllables) operating with the same spelling pattern: *bat, hat, cat, mat, fat, sat, lat, pat, rat, splat*, and so on. It can apply these same patterns to syllables in polysyllabic words: *in-ter-est-ing, Cin-der-rel-la, tel-e-phone, el-e-phant*. Ehri calls this the consolidation phase because at this phase the letters that were formerly processed one at a time are now consolidated—they are processed in chunks. Many recognized one-syllable chunks pave the way for recognizing thousands of multisyllabic words with the same chunks, and once the child begins to recognize multisyllabic words other regular patterns in the spelling system reveal themselves—doubling consonant patterns, for example, in words such as *hopping, hoping, mopping, and moping* (Templeton and Bear 1992; Venezky 1970). Children generally learn to read these words first, and learning

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to spell them perfectly comes later because it's much easier to read words than to spell them (Bosman and Van Orden 1997; Ehri 1997).

It's a watershed event when the child begins to operate in chunks of letter patterns. With a little practice, the brain can begin to store words in memory and recognize them automatically. The whole reading process becomes much more efficient because the brain can pay even more attention to backup systems associated with spoken language, including use of context and other higher levels of processing to drive the system. Once the word recognition and spelling pattern recognition systems become automatic, the higher-level systems are in effect saying, "Turn the driving over to us!" Reading no longer has to be slow and analytical as it is in the beginning phases, but the reader can move toward fluency. New material can be read independently instead of being learned by echo reading, which depends upon repeating it from memory after the teacher has modeled it. I believe "Learning to Read and Learning to Spell Are One and the Same, Almost" and other works such as my book, *The Science of Spelling*, highlighting the reciprocity of writing and reading, provide bellwether understandings of how beginners learn to read, though little heed has been paid to it. Too often we are still lost sheep when it comes to helping beginning readers and writers make the important reading-spelling connection. Let's see how spelling unfolds in the exact same stages as phases of word learning, a discovery that largely preceded Ehri's discovery of these very same phases in reading.